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ESTABLISHMENT OF *AGATHIS PUMILA* (RATZ.)[1/] AND *CHRYSOCHARIS LARICINELLAE* (RATZ.)[2/] FOR CONTROL OF LARCH CASEBEARER[3/]

By

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ABSTRACT

In 1981, the larch casebearer population of the Boise and Payette National Forests was surveyed at nine sites to determine the success of introductions of two biological controls. Results indicate that C. laricinellae *has been established.* A. pumila *has been recovered from only two locations since its introduction.*

INTRODUCTION

Larch casebearer, *Coleophora laricella* (Hubner), was introduced into the United States from Europe. It first appeared in Massachusetts in 1886, and in 1957, the casebearer was first discovered in northern Idaho feeding on western larch (*Larix occidentalis*, Nutt.) (Denton 1979). By the spring of 1977, the pest had extended its range south of Idaho's main Salmon River (Valcarce 1978) and now has established itself throughout the western larch type in southern Idaho (Knapp in progress).

Casebearer feeding results in defoliation, the majority of which occurs in the spring when maturing fourth instar larvae devour the new foliage. As a result of this feeding, needles eventually turn brown and the discolored foliage is most evident in June. The most serious results of defoliation are reduced growth potential and decline in tree vigor, but

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1/ Hymenoptera: Braconidae
2/ Hymenoptera: Eulophidae
3/ *Coleophora laricella* (Hbn.) (Lepidoptera: Coleophoridae)
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mortality occasionally occurs, largely due to declining vigor and the competitive disadvantage with more shade-tolerant species (Denton 1965, 1979).

The larch casebearer has one generation each year. Adult moths emerge, mate, and deposit eggs from June through mid-July. Following mating, the females deposit individual eggs on the needles.

The newly hatched larva chews through and feeds within a single needle. After hollowing the entire needle, the larva chews the tip and basal portions free from the rest of the needle. This hollowed needle then forms the "case" surrounding the casebearer larva. In mid- to late August, the larva begins to feed externally on the foliage, successively mining the interior of needles.

With the onset of fall weather, the larva stops feeding and prepares to overwinter within its case, which is firmly attached to a twig. With the flush of new foliage in the spring, the larva resumes feeding, which becomes most intensive during these late larval stages.

Pupation occurs in mid- to late May. During this two-week period the transformation from larva to adult occurs. With the emergence of the adult moths, the generation is completed.

Since larch casebearer was introduced to the Idaho area only about 30 years ago, few natural control agents are active. For this reason, emphasis has been placed on introducing casebearer parasites. A parasite release program was begun around St. Maries, Idaho, in 1960 with the introduction of a tiny braconid wasp, *Agathis pumila* (Ratz.) (Denton 1979).

In June 1978, following the discovery of the casebearer range extension into southern Idaho in 1977, *A. pumila* was introduced into nine areas on the Boise and Payette National Forests (Valcarce 1979). An evaluation in 1979 found *A. pumila* present at only one of the nine release sites (Valcarce 1980). Valcarce (1980) speculated that additional time was needed to establish *A. pumila* before they could be recovered.

In April 1980, a second biological control agent, a eulophid wasp, *Chrysocharis laricinellae* (Hubner), was released at five sites on the Boise and Payette National Forests (Valcarce and Lowe 1980).

In June 1981, I evaluated the effectiveness of these 1978 and 1980 introductions by attempting to recover these wasps from their release sites. Additionally, I monitored the larch casebearer population and its native parasite complex.

METHODS

In early June 1981, I surveyed seven sites on the Payette National Forest and two on the Boise National Forest (Figure 1). Using the methods employed by Valcarce (1980), four mid-crown branches were cut, one from

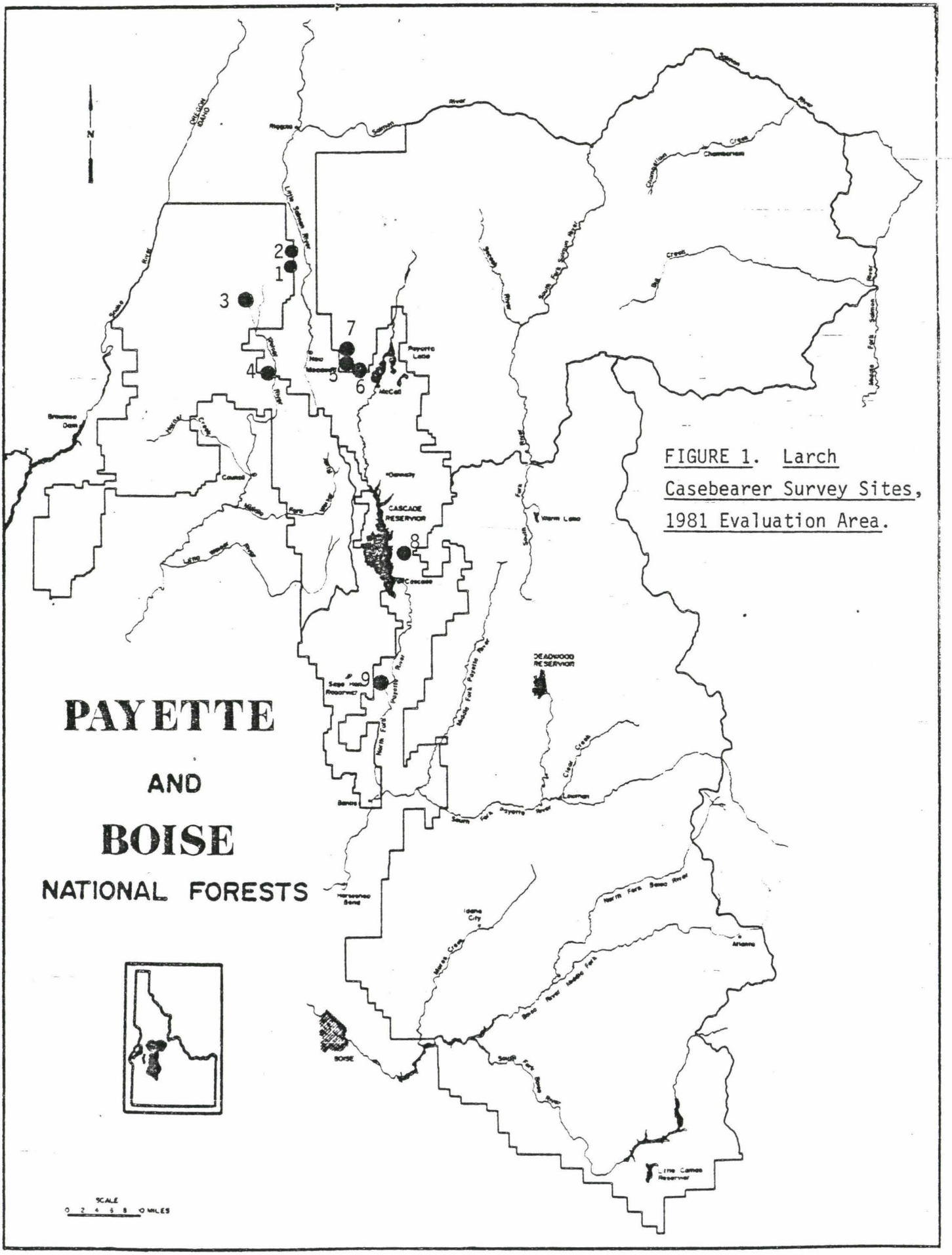

FIGURE 1. Larch Casebearer Survey Sites, 1981 Evaluation Area.

each quadrant on ten dominant or co-dominant larch trees at each sample site. Casebearer pupae and the number of needle fascicles were counted on each branch. The average number of pupae per 100 fascicles was then computed. Pupae from the sample branches were contained in petri plates to rear casebearer parasites. Parasites were collected, identified, and counted. The overall percent parasitism and that portion of parasitism attributable to *A. pumila* and *C. laricinellae* was determined for each site. Constancy and relative abundance for each parasite recovered was also computed. Constancy indicates the percentage of plots containing the parasite species, and relative abundance indicates the proportional representation of each parasite species from all samples.

RESULTS

Larch casebearer pupal populations ranged from 1.1 to 81.8 casebearer pupae per 100 needle fascicles. This indicates an upward casebearer population trend for all plots with the exception of Lower Boulder Creek, Little Goose Creek, and Lost Valley. Past and present casebearer pupal population counts are contained in Table 1.

TABLE 1. Larch Casebearer Survey Summary, Boise and Payette National Forests, Idaho, 1981.

Map Locator Number	Area	Mean Number of Pupae/100 Fascicles		
		1981	1979	1977
	Payette NF			
1	Lower Boulder Creek	2.7	5.3	6.65
2	Upper Boulder Creek	2.0	0.5	0.23
3	Railroad Saddle	1.1	-0-	--
4	Lost Valley	6.7	11.9	2.65
5	Lower Goose Creek	81.8	16.5	12.13
6	Little Goose Creek	2.9	67.5	--
7	Upper Goose Creek	2.0	0.1	--
	Boise NF			
8	Cascade	10.1	1.5	1.3
9	Smith's Ferry	11.9	5.7	2.03

Eight species of parasites were recovered, and casebearer pupae at all nine sample sites had sustained some degree of parasitism (Table 2). The highest level of parasitism was 21 percent at Lost Valley where *C. laricinellae* was the most abundant parasite. The lowest level of parasitism, 3 percent, occurred at both Cascade and Lower Goose Creek (Table 3).

TABLE 2. LARCH CASEBEARER PARASITE SUMMARY, BOISE AND PAYETTE NATIONAL FORESTS, IDAHO 1981

Parasite	Area[1/]									Constancy (%)	Relative Abundance (%)
	Lower Goose Creek	Smith's Ferry	Lost Valley	Railroad Saddle	Upper Goose Creek	Cascade	Lower Boulder Creek	Upper Boulder Creek	Little Goose Creek		
Chrysocharis larcinellae	●[2/]	●	●	●	●	●	●	●	●	100	66.1
Spilochalis albifrons	●	●	●			●	●			56	23.8
Bracon sp.	●		●		●					33	3.0
Scambus sp.		●								11	4.8
Campoplex sp.		●								11	0.6
Agathis pumila				●						11	0.6
Itoplectis sp.	●									11	0.6
Mesopolobus sp.	●									11	0.6

1/ ranked by species richness

2/ ● indicates species presence

TABLE 3. LARCH CASEBEARER PUPAL PARASITISM, BOISE AND PAYETTE NATIONAL FORESTS, IDAHO, 1981.

Area	Total Pupal Parasitism (%)			Pupal Parasitism (%) by C. laricinellae 1981	Pupal Parasitism (%) by A. pumila 1981	Past Parasite Introductions[1/]
	1981	1979	1977			
Payette NF						
Lower Boulder Creek	8.0	8	11.3	5.3	-0-	◒
Upper Boulder Creek	16.0	9	-0-	16.0	-0-	◒
Railroad Saddle	14.3	-0-	--	7.2	7.2	◒
Lost Valley	21.0	19	--	19.2	-0-	●
Lower Goose Creek	3.0	4	--	1.5	-0-	●
Little Goose Creek	14.0	7	--	14.0	-0-	●
Upper Goose Creek	11.0	-0-	--	2.8	-0-	◒
Boise NF						
Cascade	3.0	3	--	2.0	-0-	●
Smith's Ferry	10.0	11	3.7	5.9	-0-	●

1/ ◒ 1978 release of A. pumila

● 1978 release of A. pumila and 1980 release of C. laricinellae

A. *pumila* has still not been established. It was recovered from only one sample site, Railroad Saddle, where it made up half of the parasite complex (Table 3). This half, however, was represented by only a single specimen. This single recovery results in a disappointingly low constancy and relative abundance (Table 2).

The introduction of *C. laricinellae* has been successful. Not only was the wasp recovered from all sample sites, but it had the highest relative abundance of all parasites (Table 2). That portion of parasitism, attributable to *C. laricinellae*, at individual sites ranged from 1.5 to 19.2 percent. When comparing these values and total percent parasitism, it is evident that *C. laricinellae* was responsible for the majority of parasite-caused casebearer mortality at most sites (Table 3).

Six native species of parasites were reared. Their populations were mostly localized and generally of low relative abundance (Table 2). Constancy ranged from 11 to 56 percent, and relative abundance from 0.6 to 23.8 percent. Of the native parasites, *Spilochalis albifrons* (Walsh) was the most widespread and abundant.

Parasite species richness was variable. At Lower Goose Creek five species of parasites were recovered, and at Upper Boulder Creek and Little Goose Creek only *C. laricinellae* was found (Table 2).

DISCUSSION

Table 1 indicates that casebearer populations have generally been increasing since their discovery in southern Idaho in 1977. Valcarce (1978) stated in his original evaluation that the population consisted of an average of three casebearer pupae per 100 needle fascicles. In 1981, this average increased to 13.5. In Denton's (1979) discussion of the relationship of casebearer densities to defoliation, pupal counts must reach at least 30-31 pupae per 100 needle fascicles to categorize subsequent defoliation as moderate. Southern Idaho has not yet attained these population levels, but defoliation is heavy, suggesting that fewer insects create more damage in southern Idaho than in northern Idaho.

Casebearer parasitism has increased. When compared with Valcarce's (1978, 1980) findings, both the parasite species composition and degree of parasitism have increased (Table 3). These increases are encouraging since casebearer populations have grown. Valcarce (1978) found low populations of *Gelis tenellus* (Say), *Dicladocerus nearcticus* Yoshimoto, and *Pristomerus* spp., which I did not recover in 1981. He also identified *Scambus* (*scambus*) *decorus* Wly. and *B. pygmaeus* Prov. which may be the species of *Bracon* and *Scambus* that I found. In 1979, a single specimen of *Tetrastichus* sp. was found (Valcarce 1980). Given these earlier parasite recoveries and those I found, there are at least 10 to 12 parasitic wasps linked to the casebearer in southern Idaho.

A. *pumila* has not established itself as expected. Following its widespread introduction in 1978 (Table 3), Valcarce (1980) recovered only four specimens from Lost Valley in his follow-up evaluation. My evaluation was also

disappointing, having reared one specimen from Railroad Saddle. Therefore, it appears A. *pumila* has established very low populations at only two introductory sites.

C. *laricinellae* has not only been established but has also become a major parasite of casebearer. Its distribution encompasses all evaluation areas which is probably due to past release efforts. Valcarce (1980) mentioned that C. *laricinellae* had coincidentally been introduced with A. *pumila* in 1978. This may explain its broad distribution. This wasp is undoubtedly exerting the greatest parasite pressure on casebearer at present.

With casebearers' extension into southern Idaho, both native and introduced parasites have become established. Although parasitism levels are generally low, they should increase with time. Since A. *pumila* has been found to be an effective biological control in other areas (Denton 1979), in the future, natural control of larch casebearer can probably be best attained through re-introduction of A. *pumila* and other exotic parasites which have been established in the northwest.

ACKNOWLEDGMENT

Dr. R. Ryan, Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon, verified my parasite identifications.

LITERATURE CITED

Denton, R. E. 1965. Larch casebearer in western larch forests. USDA For. Serv. Forest Pest Leaflet 96. 6 pp.

Denton, R. E. 1979. Larch Casebearer in western larch forests. USDA For. Serv., Int. For. and Range Exp. Stn. Gen. Tech. Rpt. INT-55. Ogden, Utah. 62 pp.

Knapp, K. A. In progress. Foliar discoloration of western larch on the Boise and Payette National Forests. USDA For. Serv., Int. Region, Ogden, Utah.

Valcarce, A. C. 1978. Biological evaluation larch casebearer, Payette National Forest, 1977. USDA For. Serv., Int. Region, Ogden, Utah. 7 pp.

Valcarce, A. C. 1979. Biological control - larch casebearer - 1978, release of *Agathis pumila* in Region 4. USDA For. Serv., Int. Region, Ogden, Utah. 4 pp.

Valcarce, A. C. 1980. Larch casebearer Payette and Boise National Forests. USDA For. Serv., Int. Region, Ogden, Utah. 9 pp.

Valcarce, A. C. and C. A. Lowe. 1980. Biological control - larch casebearer, release of *Chrysocharis laricinellae* in the Intermountain Region, 1980. USDA For. Serv., Int. Region, Ogden, Utah. 7 pp.